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PATENT SPECIFICATION

1,167,173

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1,167,173



Date of Application (No. 43688/66) and filing Complete Specification: 30 Sept., 1966.

Application made in United States of America (No. 492,268) on 1 Oct., 1965.

Complete Specification Published: 15 Oct., 1969.

Index at acceptance:— C4 X11; A5 B771.

International Classification:—C 09 k 3/30.

COMPLETE SPECIFICATION.

Aerosol Astringent Systems.

We, JOSEPH GEORGE SPITZER and MARVIN SMALL, both Citizens of the United States of America, residing respectively at 722, Cove Road East, Mamaroneck, New York, and 1100, Park Avenue, New York, New York, both of the United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a novel astringent and anti-perspirant aerosol system. More particularly, this invention relates to a novel astringent and anti-perspirant formulation which enables a liquid spray of an astringent to be dispensed in a conventional aerosol bomb. The aerosol astringent and anti-perspirant formulation of this invention consists essentially of an astringent material in a fine powder form suspended in a liquid vehicle which is essentially anhydrous; the liquid vehicle being of such nature that upon release of the contents from the container, the powder astringent is deposited on the skin in the form of a liquid suspension of the astringent powder.

Prior to the instant invention, there has not been available a truly commercially acceptable aerosol anti-perspirant and deodorant composition that could be packaged in a conventional metal aerosol bomb. In order to provide effective anti-perspirant activity, it is essential that there be present an astringent material. Water-soluble aluminum salts such as aluminum sulfate containing water of crystallization, aluminum chloride and aluminum chlorohydrate, which have attained increasing importance in the United States, have proved to be most effective anti-perspirants.

The above-mentioned astringents and anti-perspirants are effective when present

in aqueous solution. Hence, heretofore, it has generally been the practice in formulating anti-perspirant preparations employing such aluminum salts (e.g. creams, lotions, etc.) to include therein a sufficient amount of water to carry the required concentration of anti-perspirant in solution.

Unfortunately, water-containing aerosol anti-perspirant formulations cause major problems when contained in conventional metal aerosol bombs. One of the major problems is corrosion caused by the corrosive action of the aluminum salt in solution. Another problem has been that the use of an effective concentration also tends to cause valve malfunction due to the crystallization of the salts in the valve orifice.

Attempts have been made to solve the above-mentioned problems resulting from the use of aqueous solutions of aluminum salts by incorporating the aluminum salt in an aerosol package in such a manner that it is expelled and applied in the form of a powder. In practice this has not been satisfactory. Clouds of dust are expelled and because of the proximity of the under-arm to the face, volumes of astringent aluminum salt are breathed by the user.

There has been proposed a self-propelling, powder-dispensing composition comprising a finely-divided powder suspended in a liquefied propellant having a vapour pressure of at least 13 lbs. per square inch gauge at 70°F., and a liquid non-ionic surface-active agent having a hydrophile-lipophile balance of less than 10, which surface-active agent is dissolved in said liquefied propellant, the said finely-divided powder being substantially insoluble in the mixture of propellant and surface-active agent, and, when said finely-divided powder is water-soluble, said composition containing not more than 300 parts per million of moisture and which

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composition also comprises a minor amount of a higher alkyl halide quaternary salt of pyridine or substituted pyridine.

The use of higher alkyl halide quaternary salts of pyridine or substituted pyridine is neither necessary nor desirable in the compositions of the present invention.

An object of this invention is to provide improved aerosol astringent formulations which when contained in conventional metallic aerosol containers cause minimum or negligible internal container difficulties, and in particular, improved results with respect to corrosion and/or valve malfunction.

A further object of this invention is to provide an improved aerosol astringent composition which, when dispensed from a suitable container, is applied to the skin as a wet spray in the form of a liquid suspension of astringent material, said astringent material being activated to effect anti-perspirant activity by the moisture of the air and the body.

A further object of this invention is to provide an improved astringent preparation which may be applied to the skin as a wet spray of astringent which imparts thereto a feeling of lubrication and also reduces the likelihood of breathing the astringent as would be the case when a dry powder or dust of astringent material is dispensed from a container and applied to the skin.

Another object of this invention is to provide an improved astringent preparation in aerosol form which minimizes valve malfunction such as clogging and leakage.

It has been found that the objects of this invention may be realized by providing an aerosol astringent composition comprising an astringent material in fine powder form suspended in a liquid vehicle which is essentially anhydrous, the liquid vehicle containing as essential components a liquefied propellant and a non-volatile, non-hygroscopic liquid. When stored in a suitable aerosol container, the astringent material is in an inactive state because of the essentially anhydrous environment rather than in a water-solution active form. Hence, because of the inactive nature of the astringent while in the container the problem of corrosion caused by the corrosive action of the astringent when in its active state is avoided. Upon release from the container, however, the astringent is applied to the skin, as a wet spray, in the form of a liquid suspension of fine powder astringent, the astringent material exhibiting astringent and anti-perspirant properties when converted to its active form by the moisture in the air and on the body.

As indicated hereinbefore, an essential component of the liquid vehicle of the aerosol formulation of this invention is a non-volatile, non-hygroscopic liquid. Such non-volatile, non-hygroscopic liquid component serves to maintain the expelled and deposited astringent powder as a liquid, relatively dust-free spray.

Depositing the astringent on the skin in the form of a liquid spray containing the astringent powder dispensed in a non-volatile liquid affords many advantages. First of all, since a liquid rather than a dry powder is applied to the skin, the skin feels lubricated and does not feel dry and harsh, as would be the case if a powder was deposited on the skin.

Secondly, since the liquid component of the wet spray is non-volatile, the spray effectively adheres to the skin so that the astringent when in its active form can exert effective anti-perspirant activity over a desired long period of time.

Thirdly, if a non-volatile liquid were not part of the liquid vehicle for the astringent powder of the aerosol formulation, the resulting product when dispensed from the container would be a fine dust which would settle very slowly. When sprayed under the arms, it would be quite difficult to avoid breathing the dust, with the result that the astringent would enter the lungs. When the liquid vehicle contains a non-volatile liquid, as is the case in the instant invention, the droplets of the resulting spray are relatively large and settle rapidly. Consequently, the likelihood of breathing the astringent is very much reduced.

A further advantage in the use of a non-volatile non-hygroscopic liquid as a component of our aerosol formulation, is that it, in combination with the other liquefied components, maintains the anti-perspirant aluminum salts in an insoluble, non-ionizing condition, as a consequence of which the salts are non-corrosive to metals.

From the above discussion, it becomes readily apparent that if one is to realize the desired objectives, a non-volatile, non-hygroscopic liquid must be included as an essential component for mixture with the liquefied propellant in providing the desired liquid vehicle for the astringent powder. The use of a volatile component, e.g. alcohol, instead of a non-volatile component would not give suitable results. First, since alcohol is of a volatile nature, it would evaporate fairly quickly to leave a powder deposited on the skin, the disadvantages of which have been discussed hereinbefore in detail. Second, it would be much more difficult to compound with alcohol and keep it anhydrous than with a non-volatile, non-hygroscopic liquid used in accordance with the instant invention. Even if only a small amount of water were introduced, as would be quite probable if alcohol were employed, corrosion would result. Third, by using a

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volatile liquid, such as alcohol, any liquid residue which remains on the actuator, upon the rapid evaporation of the volatile liquid, results in the formation of a small residue of powdered dry aluminum salt. This picks up moisture from the atmosphere which dissolves the aluminum salt; if some moisture evaporates or the temperature drops, large crystals form which clog the actuator. These problems are avoided by the use of a non-volatile, non-hygroscopic liquid.

The principles of this invention are applicable to any astringent material which, in dry powder form is in an inactive state, but, which, in the presence of moisture, is converted to an active state. Examples of astringents of the aforementioned type are the astringent salts of multi-valent cations such, for example, as the divalent astringent salts exemplified by zinc chloride, zinc sulfate and zinc sulfocarbonate, the trivalent astringent salts such as aluminum sulfate, aluminum chloride, aluminum sulfocarbonate, aluminum chlorohydrate, ferric chloride; and tetra valent astringent salts such as zirconium tetrachloride, zirconium sulfate. The preferred anti-perspirant agents of this invention are the above-mentioned astringent aluminum salts.

Suitable non-volatile, non-hygroscopic liquid for use in combining with the liquefied propellant in providing the desired liquid vehicle are essentially non-polar organic liquids having: (a) a vapor pressure less than 25 mm of mercury at 70°F; (b) a boiling point at atmospheric pressure not lower than 250°F; (c) a dielectric constant not greater than 10, and preferably less than 5; (d) a specific gravity between 0.7 and 1.6 and preferably between 0.7 and 1.2; and (e) a water insolubility such that it will not dissolve more than 5% of water at 70°F. Examples of such materials are hydrophilic oils such as hydrocarbon oils exemplified by tetradecane; organic esters such as isopropyl myristate and glyceryl trioleate; alcohols such as lauryl alcohol; carboxylic acids such as oleic acid; and, silicone oils such as the dimethylpolysiloxanes.

Any conventional propellant, or mixture of propellants may be used that has the desired vapor pressure at atmospheric temperature to effect dispensing of the contents of the container but which pressure is not unduly excessive so as to cause excessive dusting when the astringent formulation is sprayed against the skin. Generally, the vapor pressure is in the range of 15 to 75 p.s.i.g. at 70°F., and preferably 20 to 50 p.s.i.g. Examples of materials that may be used as a propellant component, either alone or in admixture, are trichlorofluoromethane (Freon 11—"Freon" is a Trade Mark), dichlorodifluoromethane (Freon 12), tetra-

fluorodichloroethane (Freon 114), pentafluoromonochloroethane (Freon 115), cyclic hexafluorodichlorobutane (Freon C 316), octafluoropropane (Freon 218), cyclic octafluorobutane (Freon C 318), propane, butane, pentane and isobutane.

Also, the propellant should not react with the astringent material or the non-volatile, non-hygroscopic liquid or any other constituent of the aerosol formulation to create difficulties while the aerosol formulation is contained in the can or deleteriously affect their desired activities when applied to the skin.

The astringent should be in an amount sufficient to impart the desired anti-perspirant activity when activated by the moisture in the air but should not be in too great an amount to cause excessive dusting when sprayed against the skin. In general, the astringent is in an amount from .2 to 10% and preferably .5 to 5% by weight of the total composition, and in an amount from .01 to 1.0 part by weight and preferably .05 to .3 part per part of the non-volatile, non-hygroscopic liquid. Also, the astringent should have a particle size sufficiently small to minimize valve malfunction. In general, the astringent powder has a particle size in the range of 1 to 100 microns, and preferably less than 50 microns.

The non-volatile, non-hygroscopic liquid should be in an amount sufficient whereby the astringent is deposited on the skin in the form of a wet spray but should not be in too high an amount wherein it would interfere with the anti-perspirant action of the astringent as well as causing the wet spray deposited on the skin to be of too oily a nature. In general, the non-volatile non-hygroscopic liquid is in an amount from 2 to 50% by weight of the total composition, preferably 5 to 25% by weight.

As indicated hereinbefore, the propellant should be in an amount to provide the desired vapor pressure for dispensing the desired contents from the container without causing excessive dusting when the wet spray containing the dispensed astringent is applied against the skin. In general, the propellant is in an amount from 50 to 98% by weight of the total composition, preferably 75 to 95% weight.

It has been found desirable to incorporate in the aerosol compositions of this invention certain materials which have grease-like imparting properties to the non-volatile, non-hygroscopic liquid and greatly aid in preventing malfunction of the aerosol valve. These materials are characterized by the fact that they prevent compacting of the anti-perspirant powder in the completed composition and they also act as thickening or jelling agents for the non-volatile, non-hygroscopic liquid. Examples of such materials are

hydrophobic treated clays that swell in organic solvents, e.g. hydrophobic bentonite, e.g. Bentone 34 ("Bentone" is a Trade Mark), a reaction product of bentonite and dimethyl distearyl ammonium chloride, the latter constituting one third of the Bentone compound; colloidal silicas, e.g. Cab-O-Sil M-5, a submicroscopic particulate silica prepared in a hot gas environment (1100°C.)

5 by the vapor phase hydrolysis of a silicon compound; grease forming soaps such as aluminum stearate. Agents of the afore-described type are of colloidal dimensions and in general have a particle size below 5 microns. In general, these agents are in an amount up to 1% by weight of the total composition and preferably .05 to 1% by weight.

10 As is the usual practice for astringent cosmetic compositions, there may be included small amounts of a perfume. In general, the perfume is in an amount up to 2% by weight of the total composition, and preferably .05 to 2% by weight.

15 Also, if so desired, there may be included in our aerosol formulation, a small amount of an anti-bacterial agent, e.g. hexachlorophene, to impart thereto deodorant characteristics. In general, the anti-bacterial agent is in an amount up to 0.5% by weight of the total composition, and preferably .02 to 0.2% by weight.

20 In order to illustrate the invention more specifically, the following working examples are now given:

EXAMPLE 1

	Parts by Weight
40 Aluminum chlorohydrate impalpable powder	2.0
Hexachlorophene	0.1
Bentone #34	0.3
Isopropyl myristate	6.0
45 Trifluorotrichloroethane	12.6
Tetrafluorodichloroethane	65.0
Difluorodichloromethane	14.0

EXAMPLE 2

	Parts by Weight
50 Aluminum chlorohydrate impalpable powder	3.0
3,5,4'-Tribromosalicylanilide	0.1
Cab-O-Sil, M-5	0.6
Butyl stearate	10.0
55 Tetrafluorodichloroethane	66.3
Difluorodichloromethane	20.0

EXAMPLE 3

	Parts by Weight
Aluminum sulfocarbolate (less than 50 microns diameter)	4.0
Hexachlorophene	0.2
Cab-O-Sil, M-5	0.5
Mineral Oil	5.0
Hexane	10.0
Isobutane	80.3

EXAMPLE 4

	Parts by Weight
Aluminum sulfate (less than 50 microns diameter)	50
3,5,4'-Tribromosalicylanilide	1.0
Bentone #34	0.2
Isopropyl palmitate	0.4
Fluorotrichloromethane	10.0
Difluorodichloromethane	63.4
	75
	25.0

EXAMPLE 5

	Parts by Weight
Aluminum chlorohydrate impalpable powder	2.0
Hexachlorophene	0.2
Bentone #34	0.3
Oleyl Alcohol	5.0
Hexane	10.0
Tetrafluorodichloroethane	52.5
Difluorodichloromethane	30.0
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EXAMPLE 6

	Parts by Weight
Aluminum chlorohydrate impalpable powder	2.0
Hexachlorophene	0.1
Isopropyl myristate	6.0
Trifluorotrichloroethane	12.9
Tetrafluorodichloroethane	65.0
Difluorodichloromethane	14.0
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The invention in its broader aspects is not limited to the specific compositions, steps, methods, combinations and improvements described, but departures may be made therefrom within the scope of the accompanying claims without departing from the principles of the invention and without sacrificing its chief advantages.

WHAT WE CLAIM IS:—

1. An aerosol astringent and anti-perspirant composition which comprises an

5 astringent in fine powder form dispersed in a liquid vehicle which is substantially anhydrous, the liquid vehicle containing a liquefied propellant and a non-volatile non-hygroscopic liquid, the astringent being in an inactive state when in dry powder form but, which, in the presence of moisture is converted to an anti-perspirant active form in which the astringent is present in an amount of from 0.2 to 10% by weight, and in which the non-volatile non-hygroscopic liquid is present in an amount from 2 to 50% by weight of the total composition.

10 2. A composition as claimed in claim 1 in which the astringent is an astringent salt of a multi-valent cation.

15 3. A composition as claimed in claim 2 in which the salt is an aluminum salt.

20 4. A composition as claimed in any preceding claim in which the astringent is present in an amount from 0.5 to 5% by weight.

25 5. A composition as claimed in any of claims 1 to 4 in which the astringent is present in an amount of from 0.01 to 1.0 part by weight per part of the non-volatile non-hygroscopic liquid.

30 6. A composition as claimed in claim 5 in which the astringent is present in an amount from 0.05 to 0.3 part by weight per part of the non-volatile non-hygroscopic liquid.

35 7. A composition as claimed in any of claims 1 to 6 in which the astringent is present as a powder having particle size less than 100 microns.

40 8. A composition as claimed in claim 7 in which the astringent is present in powder form having a particle size less than 50 microns.

45 9. A composition as claimed in any of claims 1 to 8 in which the propellant is a hydrocarbon or halogenated hydrocarbon or mixture thereof.

50 10. A composition as claimed in any of claims 1 to 9 in which the propellant has a vapour pressure of from 15 to 75 PSIG at 70°F.

55 11. A composition as claimed in claim 10 in which the propellant has a vapour pressure of from 20 to 50 PSIG at 70°F.

60 12. A composition as claimed in any of claims 1 to 11 in which the propellant is present in an amount from 50 to 98% by weight of the total composition.

13. A composition as claimed in claim 12 in which the propellant is present in an amount from 75 to 95% by weight of the total composition.

14. A composition as claimed in any of claims 1 to 13 in which the non-volatile non-hygroscopic liquid is a non-polar organic liquid having a vapour pressure less than 25 mm of mercury at 70°F., a boiling point at atmospheric pressure not lower than 250°F., a dielectric constant not greater than 10, a specific gravity between 0.7 and 1.6 and a water solubility such that it will not dissolve more than 5% of water at 70°F.

15. A composition as claimed in claim 14 in which the non-volatile non-hygroscopic liquid has a dielectric constant less than 5.

16. A composition as claimed in claim 14 or 15 in which the non-volatile non-hygroscopic liquid has a specific gravity between 0.7 and 1.2.

17. A composition as claimed in any of claims 1 to 16 in which the non-volatile non-hygroscopic liquid is an oil which is a hydrocarbon, ester, alcohol, acid or silicone.

18. A composition as claimed in any preceding claim in which the non-volatile non-hygroscopic liquid is present in an amount from 5 to 25% by weight of the total composition.

19. A composition as claimed in any of claims 1 to 18 in which there is also present an agent having grease imparting properties with respect to the non-volatile non-hygroscopic liquid.

20. A composition as claimed in claim 19 in which the grease-imparting agent is a hydrophobic clay, colloidal silica or soap.

21. A composition as claimed in claim 19 or 20 in which the grease-imparting agent has a particle size less than 5 micron.

22. A composition as claimed in any of claims 19 to 21 in which the grease-imparting agent is present in an amount of up to 1% by weight.

23. A composition as claimed in claim 22 in which the grease-imparting agent is present in an amount from 0.05 to 1% by weight.

24. A composition as claimed in any of claims 1 to 23 in which there is also present an anti-bacterial agent in an amount up to 0.5% by weight.

25. A composition as claimed in claim 24 in which the anti-bacterial agent is present in an amount of 0.02 to 0.2% by weight.

26. An aerosol astringent and anti-perspirant composition substantially as hereinbefore described with particular reference to any of the foregoing Examples.

27. A package comprising a pressure-tight container having a valve controlled opening, the package containing a composition for use as an astringent and anti-perspirant agent, a composition being as claimed in any of claims 1 to 26.

28. A package as claimed in claim 27 in which the container is metallic.

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